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Flexible container for transporting bulk goods - has pressure sensitive adhesive between inner and outer plastics sacks

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The flexible container for bulk goods has an outer sack (2) of plastics and an inner sack of initially loose impervious material. A pressure-sensitive adhesive (5) is applied to one or more adhesive zones (4,7,8) in corresponding pairs of at least one opposing side of the sacks. The adhesive has a low inner cohesion force so that the pairs of zones can be separated when the inner sack is expanded within the outer.

The adhesive connection between the sacks transmits the forces that the inner sack is subjected to during filling and emptying of the container to the outer sack.

ADVANTAGE - Reduced risk of leakage. (20pp Dwg.No.1/7)

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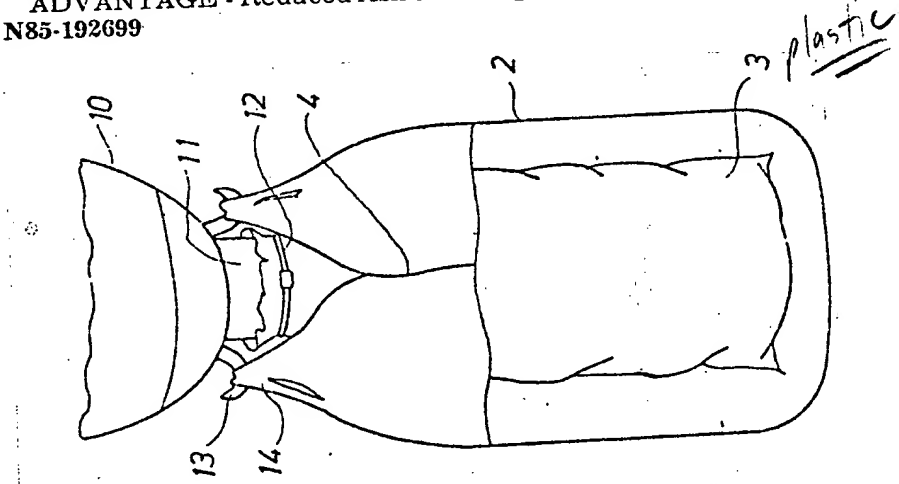

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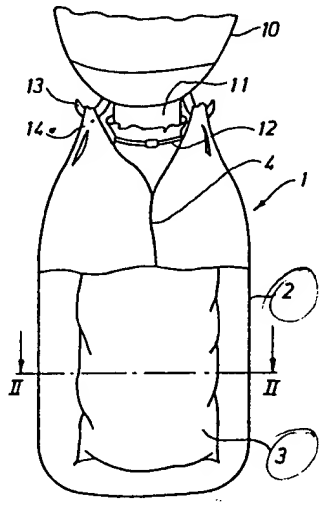
(54) A flexible container for transporting and storing bulk goods.

(57) A flexible container (1) for transporting and storing bulk goods comprises an outer sack (2) of a strong and load bearing material and an inner impervious sack (3) which is loose initially. A pressure sensitive adhesive (5) has been applied onto one or more pairs of corresponding adhesive zones (4, 7, 8) on at least one of the opposing sides of the sacks (2, 3). Subsequently, the pairs of corresponding adhesive zones have been sealingly pressed together about the adhesive (5). The adhesive presents such a low inner cohesion force that the pairs of corresponding adhesive zones (4, 7, 8) can be completely or partially separated when the inner sack (3) has expanded within the outer sack (2) by blast air or through filling in of bulk goods. The cohesiveness of the adhesive (5) is of such a magnitude that the adhesive connection between the outer sack (2) and the inner sack (1) when the latter is pressed towards the yet uncovered pressure sensitive adhesive (5) on the adhesive zones (4, 7, 8) at the termination of its expansion is capable of transferring the forces which the inner sack (3) is subjected to during the filling or emptying of the container (1) to the outer sack (2). In this manner the inner sack is not torn loose from the outer sack.

Fig.1



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A flexible container for transporting and storing bulk goods

The invention relates to a flexible container for transporting and storing bulk goods and comprising an outer sack of a strong and load bearing material, preferably plastics, and an inner sack of an impervious material, preferably plastics, and which initially is loose.

It is known to manufacture flexible containers of this type and which comprise an outer and an inner sack. The outer sack is usually made of a woven material such as for instance flat-woven or tubed polypropylene ensuring the necessary strength of the container. This material is, however, not quite impervious. Consequently, when the container is to be used for instance for hygroscopic products, it is necessary in order to ensure imperviousness to use within the outer sack an inner liner in the form of an inner sack of a relatively thin, but impervious material such as for instance 100 micron polyethylene. This inner sack is the part of the container which directly touches the bulk goods. The small thickness and particular quality of the wall of the inner sack imply that the latter is unable to receive the load exerted by the bulk goods, the weight of said bulk goods resting on the inner side of the inner sack. During the transport and the storage the forces of the above load are therefore transferred as usual forces from the wall of the inner sack to the wall of the outer sack, said walls abutting one another. During the filling and emptying procedure the bulk goods flow along the wall of the inner sack, which is thereby

subjected to forces extending in the plane of the wall. The low coefficient of friction between the plastic materials used implies that these forces cannot be transferred from the wall of the inner sack to the wall of the outer sack to a significant degree. The inner sack must therefore be secured separately to the outer sack in such a manner that it is not torn off completely or partially together with the bulk goods during the emptying procedure, said bulk goods thereby unintentionally being polluted. Furthermore, the inner sack must be kept in position relative to the outer sack during the filling procedure so that bulk goods cannot unintentionally leak out between the two sacks for instance by parts of the inner sack being crumpled up.

GB-PS No. 1,536,237 discloses a flexible container of this type. Both the outer and the inner sack of this container comprise from the beginning a bottom opening for the emptying of the bulk goods. During the transport and the storage of bulk goods the bottom opening of the inner sack is tightly closed and the same applies to the upper opening. At the upper opening the inner sack is secured by its rim portion to the outer sack. When the container is to be emptied it is raised and the bottom opening of the inner sack is opened so as to allow the bulk goods to leave. During this procedure the inner sack is secured by its rim portion to the outer sack.

These known containers are, however, rather expensive to manufacture and in particular the insertion of the inner sack into the outer sack followed by

a securing thereto is a difficult operation involving much work. Usually the latter procedure causes an insufficient connection, whereby the inner sack is completely or partially torn loose from the outer sack during the filling or emptying procedure, and consequently the previously mentioned draw-backs arise.

The object of the present invention is to provide a flexible container of the above type which is less expensive to manufacture, easier to use, requires less work, and which comprises a more reliable connection between the inner and the outer sack during the filling and emptying procedure than previously, so that the inner sack does not follow the bulk goods nor is optionally torn loose from the outer sack during the filling and emptying procedure.

The flexible container for transporting and storing bulk goods is according to the invention characterised in that a pressure sensitive adhesive has been applied onto ~~one or more~~ adhesive zones corresponding in pairs of at least one of the opposing sides of the sacks, and that each pair of adhesive zones are sealingly pressed together about said adhesive, and that the adhesive presents such a low inner cohesion force that the pairs of corresponding adhesive zones can be separated completely or partially when the inner sack is expanded within the outer sack for instance by means of blast air or through filling in of bulk goods, the cohesiveness being of such a magnitude that the adhesive connection established between the outer sack and the inner sack when the latter at the termination of

its expansion is pressed towards the adhesive now uncovered on the adhesive zones is capable of transferring the forces that the inner sack is subjected to during the filling and emptying of the container to the outer sack. As a result the establishment of a connection between the inner and the outer sack can substantially be carried out already during the manufacture of the sacks as the adhesive can be applied during the manufacture as a step of the production process. As the adhesive possesses a long open period and at the same time is sealingly positioned within the pairs of corresponding adhesive zones, its cohesiveness is maintained in such a manner that the joining of the outer and the inner sack can be carried out at any time after the manufacture for instance as a step of the filling of the container. The container according to the invention is therefore inexpensive to manufacture, easy to use, and requires less work than previous containers of this type. The resulting connection is also more reliable as the forces exerted on the inner sack during the filling and emptying procedure are transferred to the outer sack along the respective wall surfaces of the sacks. In this manner the risk of the inner sack following the bulk goods during the emptying of the container has been eliminated.

According to the invention each pair of corresponding adhesive zones is formed completely or partially by the inner side of an adhesive fold made in one of the walls of the sacks, and the total surface area of the adhesive zones corresponds to 0.5-10%, preferably 1.5-7.5% of the inner surface area of the outer sack, and the pairs of connected adhe-

sive zones sealingly pressed together about the adhesive are not separated so as to uncover the adhesive until the inner sack has expanded to such an extent that the opposing sides of the sacks free of adhesive abut one another. In this manner a particularly simple and advantageous embodiment of the connected adhesive zones is obtained, and furthermore the inner sack can easily be inserted and correctly positioned within the outer sack as it can unfold almost completely and straighten the crumpled and twisted wall portions before the respective surface portions at the opening of the adhesive zones interengage and lock the mutual position of the wall members.

Furthermore according to the invention, the adhesive folds on the outer sack may project outwardly from the remaining portion of the outer side of said outer sack, and the adhesive folds on the inner sack may project inwards from the remaining portion of the inner side of said inner sack. As a result, the inner sides of the respective adhesive folds of the sacks are positioned on the opposing sides of the sacks in such a manner that these sides are joined in a force transferring manner at the adhesive zones when the inner sack expands in the outer sack.

Moreover according to the invention the adhesive folds on the outer sack may be positioned at preferably vertically extending side seams interconnecting the side members of the sack,said side seams forming the back of the adhesive folds, and the adhesive may be applied within these adhesive folds and preferably at such a distance from the side

seams that the adhesive does not touch the tools nor the machinery used for the joining procedure. This embodiment possesses the advantage that it is not necessary to involve extra work for forming adhesive folds in the outer sack.

According to the invention the inner sack may comprise two adhesive folds, and these folds may preferably oppose one another when the sack is flattened. As a result, the sack takes up a minimum room when flattened as the adhesive folds extend in the plane of the flattened sack. The sack is therefore easy to store and to fold or roll up.

Moreover according to the invention one of the adhesive zones corresponding in pairs may be provided on a separate detachable cover strip of for instance cover film. These adhesive zones possess the advantage that they can be formed without necessitating a folding of the walls of the sacks, and they can especially be used as a supplement to be positioned on locations of the walls of the sacks that are difficult to fold.

Furthermore according to the invention each adhesive fold on the inner sack may abut the outer sack preferably in the middle between two adhesive folds thereon, each adhesive fold on the outer sack simultaneously abutting the inner sack preferably in the middle between two adhesive folds thereon when the inner sack has expanded within the outer sack. In this manner a particularly strong and reliable connection is obtained as the transfer of forces is uniformly distributed along the opposing sides of the sacks, the distance between the adhesive loca-

tions corresponding approximately to half the distance between the adhesive folds on the respective sacks. The resulting adhesive connection depends on the cohesiveness of the adhesive on both sacks in such a manner that the certainty of a satisfactory adhesive connection is doubled. In order to increase the latter certainty additionally, the adhesive on the two sacks may have different characteristics.

Moreover according to the invention, the adhesive zones on the opposing sides of the sacks may abut one another when the inner sack has expanded within the outer sack. As a result, the adhesive connection is very strong and reliable as the adhesion takes place between the uncovered surfaces of the adhesive itself on the respective adhesive zones.

Furthermore according to the invention the respective surface portions of the inner sack may be of an extent at least corresponding to the extent of the corresponding surface portions on the outer sack. As a result, the inner sack is able to expand to such an extent that it abuts the outer sack everywhere, the adhesive connections thereby being established.

Moreover according to the invention the adhesive may possess an open period of between two months and three years, preferably between six months and eighteen months. In this manner the adhesive maintains its cohesiveness within the usual period of application of the container, and also in cases where a pair of corresponding adhesive zones are not unintentionally completely sealingly pressed

together about the adhesive.

Finally according to the invention the outer sack may be subjected to a roughening treatment, whereby it is correctly positioned in a better manner than previously because it binds better on a surface having been subjected to a roughening treatment.

The invention will be described below with reference to the accompanying drawing, in which

Figure 1 is a partial sectional view through an embodiment of a container according to the invention, whereby the inner sack is expanding within the outer sack,

Figure 2 is a sectional view taken along the line II-II of Figure 1,

Figure 3 is on a larger scale a fractional view of the container of Figure 1, where the inner sack has expanded almost completely,

Figure 4 is on a larger scale a fractional view of the container of Figure 1, where the inner sack has expanded completely,

Figure 5 is a horizontal sectional view through the container of Figure 1, but with adhesive folds both on the outer and the inner sack,

Figure 6 is on a larger scale an interrupted sectional view of an inner flattened sack with two opposing adhesive folds, and

Figure 7 is a perspective view of an inner sack with a separate detachable cover strip partly removed.

Figures 1 and 2 illustrate a flexible container 1 comprising an outer sack 2 and an inner sack 3. The outer sack is made of a strong and load bearing material such as for instance flat-woven or tubed polypropylene. The latter material is, however, not completely impervious and the inner sack of an impervious, relatively thin material such as for instance 100 micron polyethylene serves therefore to ensure the necessary imperviousness of the container when it for instance is to be used for hygroscopic products.

Four adhesive folds 4 are formed on the outer sack and project outwards from the outer side of the sack. An adhesive 5 is applied within these folds and possesses particular properties. As illustrated in Figure 2, the adhesive folds are then pressed together about the adhesive in such a manner that said adhesive is sealed within the folds and protected against outer influences for instance from the air and consequently secured against being dried out. The adhesive preserves therefore its cohesiveness in such a manner that the inner sack at adhesion can be connected to the outer sack any time before the sack is to be used.

In order to ensure the above advantageous property of the container additionally, the adhesive possesses an open period of between two months and three years, preferably between six months and eighteen months in such a manner that the adhesive maintains its cohesiveness within the period upon the manufacture

where the container is usually taken into use. By subjecting the inner sack to a roughening treatment the strength and reliability of the adhesive connection can be improved as the adhesive adheres better on a roughened surface.

When the container is to be used, the inner sack 3 is pulled over a filler pipe 11, cf. Figure 1, positioned on a silo 10. The sack can be secured to the filler pipe by means of a clamping band 12 during the filling of the container. The filler pipe 11 and the inner sack 3 are subsequently inserted in the outer sack 2 being suspended for instance in hooks 13 by means of lifting straps 14. Subsequently, blast air or bulk goods are filled into the inner sack 3 through the filler pipe 11, and the pressure arising on the inner side of the inner sack expands said sack in such a manner that it extends to and is tightened towards the outer sack. The load on the inner sack is thereby transferred to the outer sack. Figures 2 and 3 illustrate the inner sack 3 in a position where it does not yet abut the outer sack 2.

The loads thus influencing the outer sack 2 are preferably usual forces absorbed by reaction forces in the wall plane of the sack. As the adhesive folds project outwards in an angle with the above plane, the adhesive is subjected to a component of a force perpendicular to the plane of the adhesive. As the specific cohesiveness of the adhesive is not sufficiently great to resist these components of a force, the adhesive folds are separated and the adhesive uncovered. When further blast air or bulk goods, respectively, is filled into the inner container, the

above expansion continues until it finally abuts the uncovered adhesive on the adhesive folds now separated, cf. Figure 4, whereby an adhesive connection is established along these adhesive zones between the inner and the outer sack.

Beyond the above usual forces between the inner and the outer sack, forces extending in the very contact surface between the two sacks arise as a consequence of the forces exerted on the inner sack by the bulk goods flowing along its inner surface during the filling and emptying procedure. Though the cohesiveness of the adhesive is sufficiently low to allow the opening of the adhesive zones and consequently an establishing of the adhesive connection, the adhesive possesses, however, a specific cohesiveness of such a magnitude that the adhesive connection is able to transfer these forces when the total area of the adhesive zones for instance corresponds to 0.5-10%, preferably 1.5-7.5%, of the inner surface area of the outer sack.

The inner sack is of a very thin flexible material and can often be crumpled or twisted when it is inserted into the outer sack. If in this state it adheres at some locations to the outer sack, it cannot expand to its complete volume, and a risk of the inner sack bursting arises when said sack thus cannot abut the outer sack everywhere and when the wall of the inner sack is not sufficiently load bearing per se to bear the weight of the bulk goods.

As the total area of the adhesive zones only corresponds to 0.5-10%, preferably 1.5-7.5%, of the

inner area of the outer sack, and as the adhesive zones are not separated until the inner sack has expanded to such an extent that the portions of the opposing sides of the sacks free of adhesive abut one another, the expansion of the inner sack has reached such an extent that substantially all the crumples and twistings are straightened before any adhesive connection is established.

The adhesive folds are provided by folding the walls of the sacks. As illustrated in Figures 2, 3, and 4, the adhesive folds 4 project outwards from the outer side of the outer sack, and as illustrated in Figure 5, the adhesive folds 7, 8 project inwards from the inner side of the inner sack in such a manner that the adhesive applied within the adhesive folds are positioned on the opposing sides of the sacks at the above separation, said opposing sides of the sacks about to being interadhered.

Figures 3 and 4 illustrate an embodiment of the outer sack, where the adhesive folds are positioned at preferably vertically extending side seams 6 interconnecting the side members of the sack, the seam 6 forming the back of the adhesive fold. This seam can be provided by sewing, welding or adhesion. The seam of the container of Figures 3 and 4 is shaped by sewing through the twice folded material simultaneously forming a bracing of the corners of the container. During the filling and emptying procedure the forces are therefore transferred from the inner sack to the outer sack where the latter is strongest. The adhesive 5 is positioned at such a distance from the machinery and the tools producing the seam, that said machinery and tools do not touch

the adhesive during the sewing. This embodiment is particularly inexpensive as the adhesive folds are formed together with the working process nevertheless having to be carried out for joining the side members of the outer sack.

Figure 6 illustrates an embodiment of the inner sack comprising two inward adhesive folds 8. When the sack is flattened these adhesive folds are preferably positioned opposite one another in such a manner that the sack takes up as little room as possible during the storing, folding, and rolling up. This embodiment is particularly suited when the inner sack is not inserted into the outer sack in direct connection with the manufacturing process but not until later.

Figure 7 illustrates an embodiment, where one pair of corresponding adhesive zones is formed by a separate detachable cover strip 9 of for instance cover film. In this manner pairs of connected adhesive zones can be provided on the locations of the sacks where it is difficult to fold the wall material for instance at the transition between the side members and the bottom.

Figure 5 illustrates an embodiment of the container where both the inner sack and the outer sack comprises four adhesive folds displaced 45° relative to one another. The distance between the adhesive connections corresponds thereby to half the distance between the adhesive folds on each sack. The total strength of the adhesive connection depends in connection with this embodiment on the adhesive properties of the adhesive on both sacks. When an

adhesive with different characteristics for the adhesive on both sacks is used, a double certainty is thus obtained for the total adhesive connection being durable during the filling and emptying of the container.

When the inner sack is displaced 45° relative to the position of Figure 5 the adhesive folds oppose one another and the adhesive connection is provided by the adhesive on the inner sack adhering to adhesive on the outer sack in such a manner that the adhesive conditions favourable to an adhesive connection are obtained.

The above embodiments according to the invention may be used for flexible containers of any size. In all cases the inner sack is of such a size compared to the outer sack that its respective surface zones are of extents at least equally great as the areas of the opposing surface zones on the outer sack. As a result, no surface zone exists on the inner sack that is not supported by the outer sack in the completely expanded state.

Other embodiments than the above may be provided according to the invention. Thus another number of adhesive folds may be present, and the pairs of corresponding adhesive zones may be formed in other ways and extend in other directions such as for instance horizontally and for instance be alone on the inner sack. The protection is only determined by the features disclosed in the following claims.

Claims:

1. A flexible container for transporting and storing bulk goods and comprising an outer sack (2) of a strong and load bearing material, preferably plastics, and an inner sack (3) of an impervious material, preferably plastics, and which initially is loose, characterised in that a pressure sensitive adhesive (5) has been applied onto one or more adhesive zones (4, 7, 8) corresponding in pairs of at least one of the opposing sides of the sacks (2, 3), and that each pair of adhesive zones (4, 7, 8) are sealingly pressed together about said adhesive (5), and that the adhesive (5) presents such a low inner cohesion force that the pairs of corresponding adhesive zones (4, 7, 8) can be separated completely or partially when the inner sack (3) is expanded within the outer sack (2) for instance by means of blast air or through filling in of bulk goods, the cohesiveness being of such a magnitude that the adhesive connection established between the outer sack (2) and the inner sack (3) when the latter at the termination of its expansion is pressed towards the adhesive (5) now uncovered on the adhesive zones (4, 7, 8) is capable of transferring the forces that the inner sack (3) is subjected to during the filling and emptying of the container (1) to the outer sack (2).

2. A flexible container as claimed in claim 1, characterised in that each pair of corresponding adhesive zones (4, 7, 8) is formed completely or partially by the inner side of an adhesive fold made in one of the walls of the sacks (2, 3), and that the total surface area of the adhesive zones

corresponds to 0.5-10%, preferably 1.5-7.5%, of the inner surface area of the outer sack (2), and that the pairs of connected adhesive zones (4, 7, 8) sealingly pressed together about the adhesive (5) are not separated so as to uncover the adhesive (5) until the inner sack (3) has expanded to such an extent that the opposing sides of the sacks (2, 3) free of adhesive (5) abut one another.

3. A flexible container as claimed in claims 1 and 2, characterised in that the adhesive folds (4) on the outer sack (2) project outwardly from the remaining portion of the outer side of said outer sack.

4. A flexible container as claimed in claims 1 and 2, characterised in that the adhesive folds (7, 8) on the inner sack project inwards from the remaining portion of the inner side of said inner sack.

5. A flexible container as claimed in claim 1, 2 or 3, characterised in that the adhesive folds (4) on the outer sack (2) are positioned at preferably vertically extending side seams (6) interconnecting the side members (6) of the sack (2), said side seams (6) forming the back of the adhesive folds (4), and that the adhesive (5) has been applied within these adhesive folds (4) and preferably at such a distance from the side seams (6) that the adhesive (5) does not touch the tools or machinery used for the joining procedure.

6. A flexible container as claimed in claim 1, 2 or 4, characterised in that the inner sack (3) com-

prises two adhesive folds (8), and that these folds preferably oppose one another when the sack (3) is flattened.

7. A flexible container as claimed in one or more of the preceding claims 1 to 6, characterised in that one of the adhesive zones corresponding in pairs is provided on a separate detachable cover strip (9) of for instance cover film.

8. A flexible container as claimed in one or more of the preceding claims 1 to 7, characterised in that each adhesive fold (7) on the inner sack abuts the outer sack (2) preferably in the middle between two adhesive folds (4) thereon, each adhesive fold (4) on the outer sack simultaneously abutting the inner sack (3) preferably in the middle between two adhesive folds (7) thereon when the inner sack has expanded within the outer sack.

9. A flexible container as claimed in one or more of the preceding claims 1 to 8, characterised in that the adhesive zones (4, 7) on the opposing sides of the sacks (2, 3) abut one another when the inner sack (3) has expanded within the outer sack (2).

10. A flexible container as claimed in one or more of the preceding claims 1 to 9, characterised in that respective surface portions of the inner sack (3) are of an extent at least corresponding to the extent of the corresponding surface portions on the outer sack (2).

11. A flexible container as claimed in one or more

of the preceding claims 1 to 10, characterised in that the adhesive (5) possesses an open period of between two months and three years, preferably between six months and eighteen months.

12. A flexible container as claimed in one or more of the preceding claims 1 to 11, characterised in that the outer sack has been subjected to a roughening treatment.

Fig.1

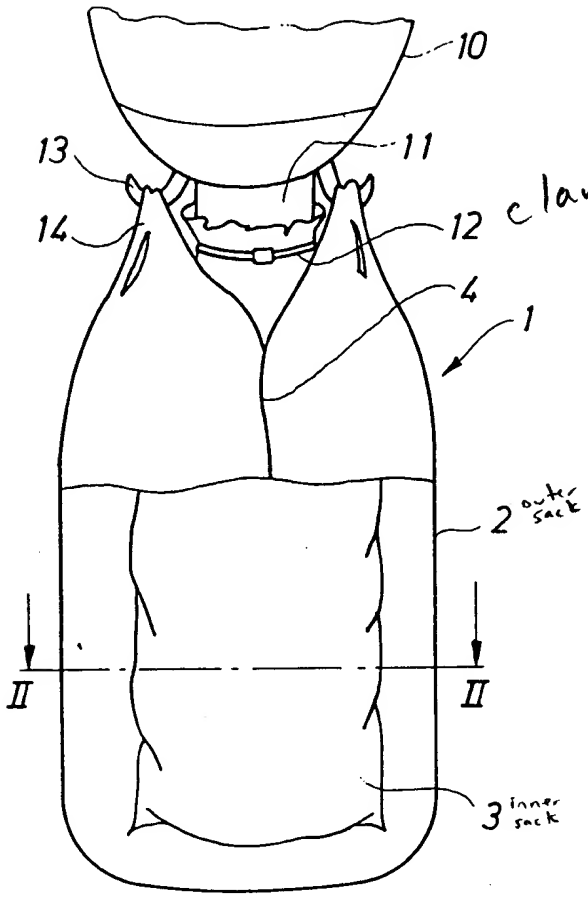


Fig.2

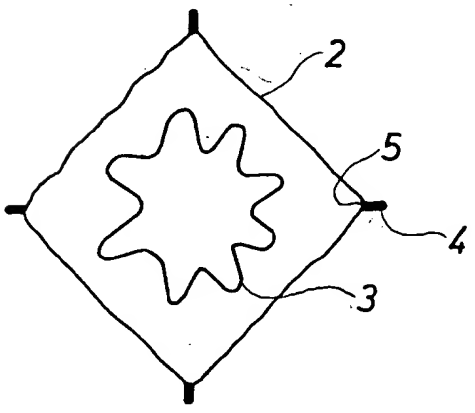
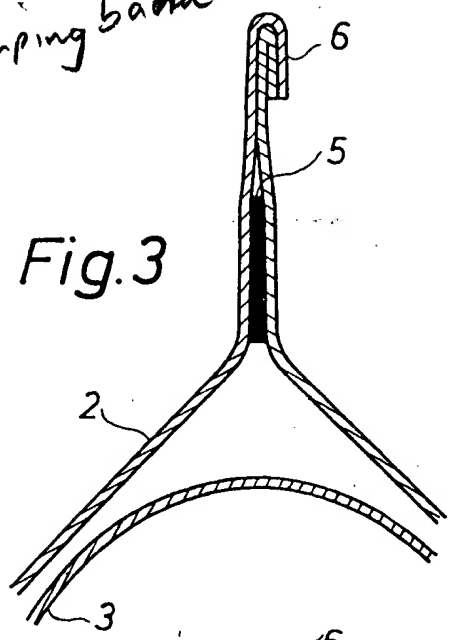


Fig.3



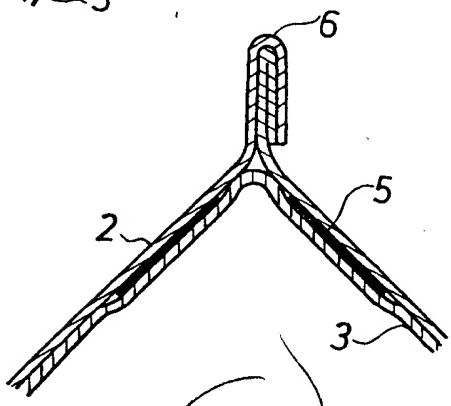


Fig.4

Fig.5

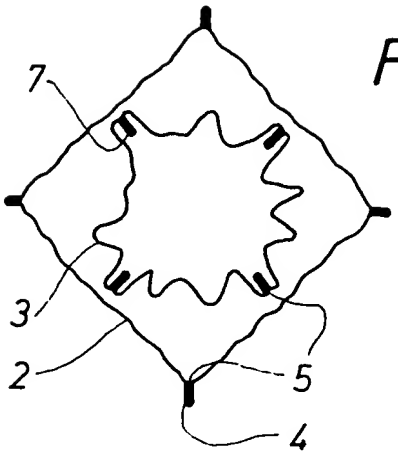


Fig.7

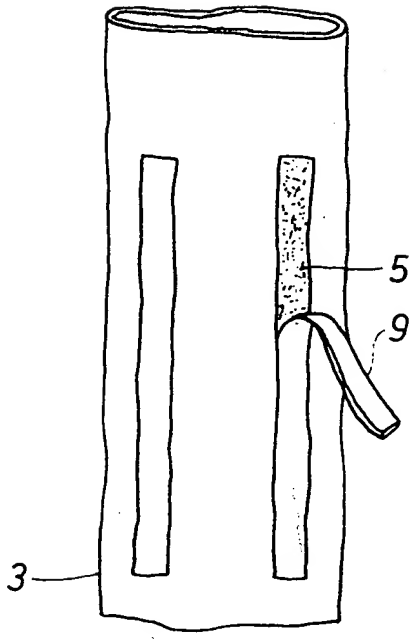


Fig.6